Water Quality Assessment
the Colorado River
City of Rifle Regional Wastewater Reclamation Facility

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I. Water Quality Assessment Summary

Table A-1 includes summary information related to this WQA. This summary table includes key regulatory starting points used in development of the WQA such as: receiving stream information; threatened and endangered species; 303(d) and Monitoring and Evaluation listings; low flow and facility flow summaries; and a list of parameters evaluated.

Table A-1
WQA Summary

Facility Information			
Facility Name	**Permit Number**	**Design Flow (max 30-day ave, MGD)**	**Design Flow (max 30-day ave, CFS)**
Rifle Regional Wastewater Reclamation Facility	CO0048151	2.0	3.1

Receiving Stream Information			
Receiving Stream Name	**Segment ID**	**Designation**	**Classification(s)**
Colorado River	COLCLC01	Reviewable	Aquatic Life Cold 1, Recreation Class E Agriculture, Water Supply

Low Flows (cfs)				
Receiving Stream Name	**1E3 (1-day)**	**7E3 (7-day)**	**30E3 (30-day)**	**Ratio of 30E3 to the Design Flow (cfs)**
Colorado River	843	923	923	298:1

Regulatory Information					
T&E Species	**303(d) (Reg 93)**	**Monitor and Eval (Reg 93)**	**Existing TMDL**	**Temporary Modification(s)**	**Control Regulation**
Yes	None	Sediment	No	Temporary modification: As(ch)=hybrid Expiration date of 12/31/21.	Regulation 85 Regulation 39 - salinity

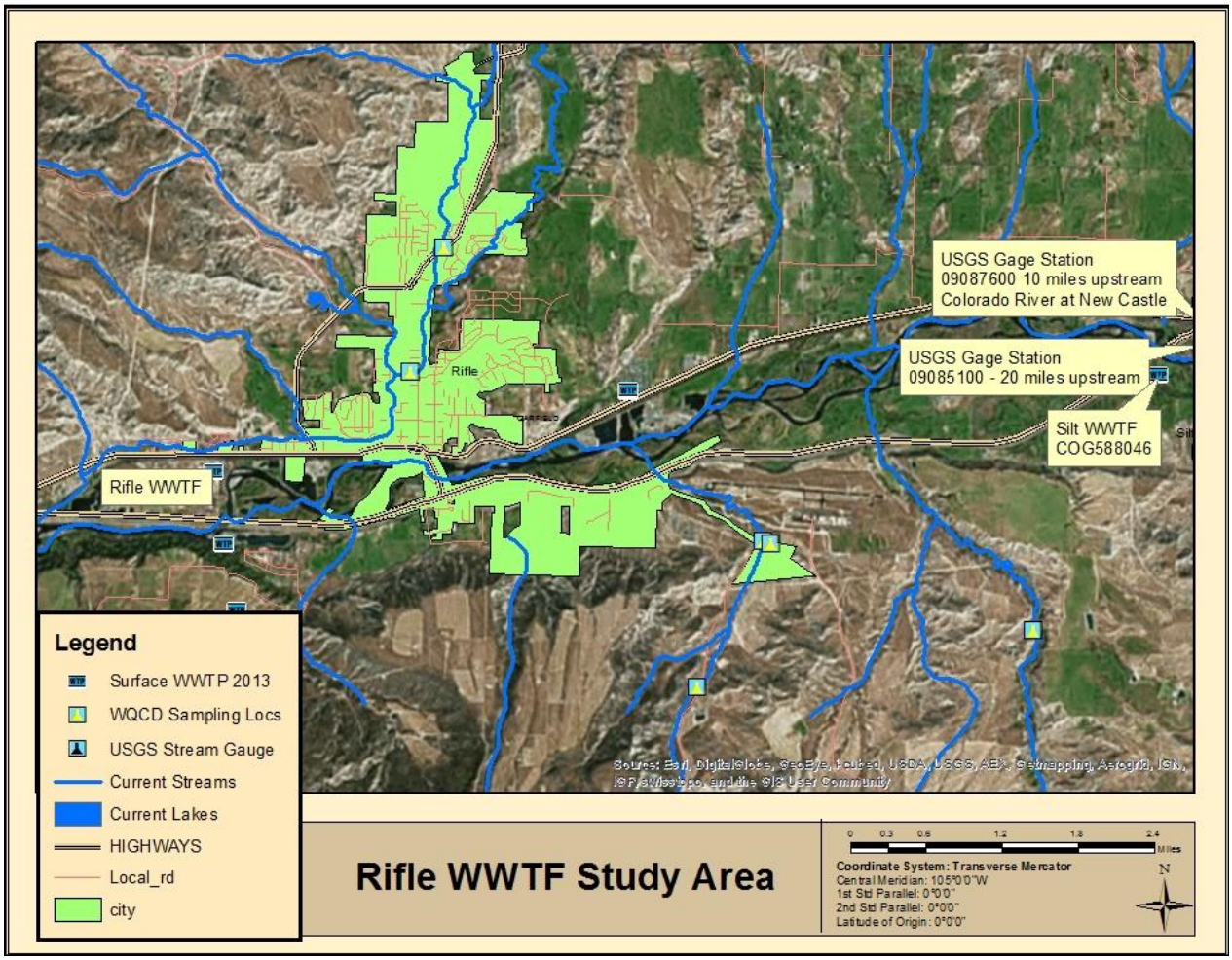
Pollutants Evaluated
Ammonia, *E. coli*, TRC, Metals, Cyanide, Temperature, Nutrients, Salinity

II. Introduction

The water quality assessment (WQA) of the Colorado River near the Rifle Regional Wastewater Reclamation Facility (Rifle WWTF), located in Garfield County, is intended to determine the

assimilative capacities available for pollutants found to be of concern. This WQA describes how the water quality based effluent limits (WQBELs) are developed. These parameters may or may not appear in the permit with limitations or monitoring requirements, subject to other determinations such as reasonable potential analysis, evaluation of federal effluent limitation guidelines, implementation of state-based technology based limits, mixing zone analyses, 303(d) listings, threatened and endangered species listing, or other requirements as discussed in the permit rationale. Figure A-1 contains a map of the study area evaluated as part of this WQA.

FIGURE A-1



The Rifle WWTF discharges to the Colorado River, which is stream segment COLCLC01. This means the Lower Colorado Basin, Lower Colorado Sub-basin, Stream Segment 01. This segment is composed of the "Mainstem of the Colorado River from the confluence with the Roaring Fork River to immediately below the confluence with Rifle Creek." Stream segment COLCLC01 is classified for Aquatic Life Cold 1, Recreation Class E, Water Supply and Agriculture.

Information used in this assessment includes data gathered from the Rifle WWTF, the Division, the Colorado Division of Water Resources (DWR), Riverwatch, the U.S. Environmental Protection Agency (EPA), the U.S. Geological Survey (USGS), and communications with the local water commissioner. The data used in the assessment consist of the best information available at the time of preparation of this WQA analysis.

III. Water Quality Standards

Narrative Standards

Narrative Statewide Basic Standards have been developed in Section 31.11(1) of the regulations, and apply to any pollutant of concern, even where there is no numeric standard for that pollutant. Waters of the state shall be free from substances attributable to human-caused point source or nonpoint source discharges in amounts, concentrations or combinations which:

for all surface waters except wetlands;

(i) can settle to form bottom deposits detrimental to the beneficial uses. Depositions are stream bottom buildup of materials which include but are not limited to anaerobic sludge, mine slurry or tailings, silt, or mud; or (ii) form floating debris, scum, or other surface materials sufficient to harm existing beneficial uses; or (iii) produce color, odor, or other conditions in such a degree as to create a nuisance or harm existing beneficial uses or impart any undesirable taste to significant edible aquatic species or to the water; or (iv) are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life; or (v) produce a predominance of undesirable aquatic life; or (vi) cause a film on the surface or produce a deposit on shorelines; and

for surface waters in wetlands;

(i) produce color, odor, changes in pH, or other conditions in such a degree as to create a nuisance or harm water quality dependent functions or impart any undesirable taste to significant edible aquatic species of the wetland; or (ii) are toxic to humans, animals, plants, or aquatic life of the wetland.

In order to protect the Basic Standards in waters of the state, effluent limitations and/or monitoring requirements for any parameter of concern could be put in CDPS discharge permits.

Standards for Organic Parameters and Radionuclides

Radionuclides: Statewide Basic Standards have been developed in Section 31.11(2) and (3) of The Basic Standards and Methodologies for Surface Water to protect the waters of the state from radionuclides and organic chemicals.

In no case shall radioactive materials in surface waters be increased by any cause attributable to municipal, industrial, or agricultural practices or discharges to as to exceed the following levels, unless alternative site-specific standards have been adopted. Standards for radionuclides are shown in Table A-2.

Table A-2 Radionuclide Standards	
Parameter	**Picocuries per Liter**
Americium 241*	0.15
Cesium 134	80
Plutonium 239, and 240*	0.15
Radium 226 and 228*	5
Strontium 90*	8
Thorium 230 and 232*	60
Tritium	20,000

*Radionuclide samples for these materials should be analyzed using unfiltered (total) samples. These Human Health based standards are 30-day average values.

Organics: The organic pollutant standards contained in the Basic Standards for Organic Chemicals Table are applicable to all surface waters of the state for the corresponding use classifications, unless alternative site-specific standards have been adopted. These standards have been adopted as "interim standards" and will remain in effect until alternative permanent standards are adopted by the Commission. These interim standards shall not be considered final or permanent standards subject to antibacksliding or downgrading restrictions. Although not reproduced in this WQA, the specific standards for organic chemicals can be found in Regulation 31.11(3).

In order to protect the Basic Standards in waters of the state, effluent limitations and/or monitoring requirements for radionuclides, organics, or any other parameter of concern could be put in CDPS discharge permits.

The aquatic life standards for organics apply to all stream segments that are classified for aquatic life. The water supply standards apply only to those segments that are classified for water supply. The water + fish standards apply to those segments that have a Class 1 aquatic life and a water supply classification. The fish ingestion standards apply to Class 1 aquatic life segments that do not have a water supply designation. The water + fish and the fish ingestion standards may also apply to Class 2 aquatic life segments, where the Water Quality Control Commission has made such determination.

Because the the Colorado River is classified for Aquatic Life Cold 1, with a water supply designation, the water + fish, and aquatic life standards apply to this discharge.

Salinity and Nutrients

Salinity: Regulation 61.8(2)(l) contains requirements regarding salinity for any discharges to the Colorado River Watershed. For industrial dischargers and for the discharge of intercepted groundwater, this is a no-salt discharge requirement. However, the regulation states that this requirement may be waived where the salt load reaching the mainstem of the Colorado River is less than 1 ton per day, or less than 350 tons per year. The Division may permit the discharge of salt upon a satisfactory demonstration that it is not practicable to prevent the discharge of all salt. See

Regulation 61.8(2)(l)(i)(A)(1) for industrial discharges and 61.8(2)(l)(iii) for discharges of intercepted groundwater for more information regarding this demonstration.

For municipal dischargers, an incremental increase of 400 mg/l above the flow weighted averaged salinity of the intake water supply is allowed. This may be waived where the salt load reaching the mainstem of the Colorado River is less than 1 ton per day, or less than 366 tons per year. The Division may permit the discharge of salt in excess of the 400 mg/l incremental increase, upon a satisfactory demonstration that it is not practicable to attain this limit. See Regulation 61.8(2)(l)(vi)(A)(1) for more information regarding this demonstration.

In addition, the Division's policy, Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops, may be applied to discharges where an agricultural water intake exists downstream of a discharge point. Limitations for electrical conductivity and sodium absorption ratio may be applied in accordance with this policy.

Nutrients

Total Phosphorus and Total Inorganic Nitrogen: Regulation 85, the *Nutrients Management Control Regulation* has been adopted by the Water Quality Control Commission and became effective September 30, 2012. This regulation contains requirements for total phosphorus and Total Inorganic Nitrogen (TIN) concentrations for some point source dischargers. Limitations for total phosphorus and TIN may be applied in accordance with this regulation.

Temperature

Temperature shall maintain a normal pattern of diurnal and seasonal fluctuations with no abrupt changes and shall have no increase in temperature of a magnitude, rate, and duration deemed deleterious to the resident aquatic life. This standard shall not be interpreted or applied in a manner inconsistent with section 25-8-104, C.R.S.

Segment Specific Numeric Standards

Numeric standards are developed on a basin-specific basis and are adopted for particular stream segments by the Water Quality Control Commission. The standards in Table A-3a have been assigned to stream segment COLCLC01 in accordance with the *Classifications and Numeric Standards for Lower Colorado River Basin*. Additionally, the parameters in Table A-3b are also being evaluated as they are parameters of concern for this facility type. These parameters are being included based on the numeric standards in Regulation 31.

Table A-3a **In-stream Standards for Stream Segment COLCLC01**
Physical and Biological
Dissolved Oxygen (DO) = 6 mg/l, minimum (7 mg/l, minimum during spawning)
pH = 6.5 - 9 su
E. coli chronic = 126 colonies/100 ml
Temperature April-Oct =18.3° C MWAT and 23.9° C DM
Temperature Nov-March = 9° C MWAT and 13° C DM
Inorganic
Total Ammonia acute and chronic = TVS
Chlorine acute = 0.019 mg/l
Chlorine chronic = 0.011 mg/l
Free Cyanide acute = 0.005 mg/l
Sulfide chronic = 0.002 mg/l
Boron chronic = 0.75 mg/l
Nitrite acute = 0.05 mg/l
Nitrate acute = 10 mg/l
Chloride chronic = 250 mg/l
Sulfate chronic = For WS, the greater of ambient water quality as of January 1, 2000 or 250 mg/l
Metals
Dissolved Arsenic acute = 340 µg/l
Total Recoverable Arsenic chronic = 0.02 µg/l; Temporary modification: As(ch)=hybrid Expiration date of 12/31/21
Dissolved Cadmium acute for trout and Dissolved Cadmium chronic = TVS
Total Recoverable Trivalent Chromium acute = 50 µg/l
Dissolved Trivalent Chromium chronic = TVS
Dissolved Hexavalent Chromium acute and chronic = TVS
Dissolved Copper acute and chronic = TVS
Dissolved Iron chronic = For WS, the greater of ambient water quality as of January 1, 2000, or 300 µg/l
Total Recoverable Iron chronic = 1000 µg/l
Dissolved Lead acute and chronic = TVS
Dissolved Manganese chronic = For WS, the greater of ambient water quality as of January 1, 2000, or 50 µg/l
Dissolved Manganese acute and chronic = TVS
Total Recoverable Molybdenum chronic = 160 ug/l
Total Mercury chronic = 0.01 µg/l
Dissolved Nickel acute and chronic = TVS
Dissolved Selenium acute and chronic = TVS
Dissolved Silver acute and Dissolved Silver chronic for trout = TVS
Dissolved Zinc acute and chronic = TVS

Table A-3b Additional Standards Being Evaluated Based on Regulation 31
Nonylphenol acute = 28 µg/l
Nonylphenol chronic = 6.6 µg/l

Table Value Standards and Hardness Calculations

Standards for metals are generally shown in the regulations as Table Value Standards (TVS), and these often must be derived from equations that depend on the receiving stream hardness or species of fish present; for ammonia, standards are discussed further in Section IV of this WQA. The Classification and Numeric Standards documents for each basin include a specification for appropriate hardness values to be used. Specifically, the regulations state that:

> The hardness values used in calculating the appropriate metal standard should be based on the lower 95% confidence limit of the mean hardness value at the periodic low flow criteria as determined from a regression analysis of site-specific data. Where insufficient site-specific data exists to define the mean hardness value at the periodic low flow criteria, representative regional data shall be used to perform the regression analysis. Where a regression analysis is not appropriate, a site-specific method should be used.

Hardness data for the Colorado River near the point of discharge of the Rifle WWTF were insufficient to conduct a regression analysis based on the low flow. Therefore, the Division's alternative approach to calculating hardness was used, which involves computing a mean hardness.

The mean hardness was computed to be 214 mg/l based on sampling data from Riverwatch station number 551 (station name) located on the Colorado River approximately 10 miles downstream from the Rifle WWTF. This hardness value and the formulas contained in the TVS were used to calculate the in-stream water quality standards for metals, with the results shown in **Table A-4**.

Table A-4

TVS-Based Metals Water Quality Standards for CO0048151

Based on the Table Value Standards Contained in the Colorado Department of Public Health and Environment Water Quality Control Commission *Regulation 37*

Parameter	***In-Stream Water Quality Standard***			***TVS Formula: Hardness (mg/l) as CaCO3 =*** **214**
Cadmium, Dissolved	Acute	3.3	µg/l	$[1.136672-0.041838\ln(\text{hardness})]e^{(0.9151(\ln(\text{hardness}))-3.6236)}$
	Chronic	0.75	µg/l	$[1.101672-0.041838\ln(\text{hardness})]e^{(0.7998(\ln(\text{hardness}))-4.4451)}$
Hexavalent Chromium, Dissolved	Acute	16	µg/l	Numeric standards provided, formula not applicable
	Chronic	11	µg/l	Numeric standards provided, formula not applicable
Copper, Dissolved	Acute	28	µg/l	$e^{(0.9422(\ln(\text{hardness}))-1.7408)}$
	Chronic	17	µg/l	$e^{(0.8545(\ln(\text{hardness}))-1.7428)}$
Lead, Dissolved	Acute	146	µg/l	$[1.46203-0.145712\ln(\text{hardness})][e^{(1.273(\ln(\text{hardness}))-1.46)}]$
	Chronic	5.7	µg/l	$[1.46203-0.145712\ln(\text{hardness})][e^{(1.273(\ln(\text{hardness}))-4.705)}]$
Manganese, Dissolved	Acute	3847	µg/l	$e^{(0.3331(\ln(\text{hardness}))+6.4676)}$
	Chronic	2125	µg/l	$e^{(0.3331(\ln(\text{hardness}))+5.8743)}$
Nickel, Dissolved	Acute	891	µg/l	$e^{(0.846(\ln(\text{hardness}))+2.253)}$
	Chronic	99	µg/l	$e^{(0.846(\ln(\text{hardness}))+0.0554)}$
Selenium, Dissolved	Acute	18.4	µg/l	Numeric standards provided, formula not applicable
	Chronic	4.6	µg/l	Numeric standards provided, formula not applicable
Silver, Dissolved	Acute	7.5	µg/l	$½\ e^{(1.72(\ln(\text{hardness}))-6.52)}$
	Chronic	0.28	µg/l	$e^{(1.72(\ln(\text{hardness}))-10.51)}$
Zinc, Dissolved	Acute	320	µg/l	$0.978e^{(0.9094(\ln(\text{hardness}))+0.9095)}$
	Chronic	242	µg/l	$0.986\ e^{(0.9094(\ln(\text{hardness}))+0.6235)}$

Total Maximum Daily Loads and Regulation 93 – Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List

This stream segment is not listed on the Division's 303(d) list of water quality impacted streams.

This stream segment is listed for monitoring and evaluation for sediment, which is not a pollutant of concern for this facility.

IV. Receiving Stream Information

Low Flow Analysis

The Colorado Regulations specify the use of low flow conditions when establishing water quality based effluent limitations, specifically the acute and chronic low flows. The acute low flow, referred to as 1E3, represents the one-day low flow recurring in a three-year interval, and is used in developing limitations based on an acute standard. The 7-day average low flow, 7E3, represents the seven-day average low flow recurring in a 3 year interval, and is used in developing limitations based on a Maximum Weekly Average Temperature standard (MWAT). The chronic low flow, 30E3, represents the 30-day average low flow recurring in a three-year interval, and is used in developing limitations based on a chronic standard.

The ratio of the low flow of the Colorado River to the Rifle WWTF design flow is 298:1

To determine the low flows available to the Rifle WWTF, USGS gage station 09085100 (Colorado River Below Glenwood), located approximately 20 miles upstream of Rifle WWTF, was used. Between this gage and the Rifle WWTF, there are ungaged tributaries that enter the Colorado River and ditches that draw from the Colorado River. A conservative analysis is adequate for this WQA because the process required to account for the tributaries and diversions to reflect the actual low flow available to the facility would be resource intensive and according to discussion with the local water commissioner, the Division determined that the outcome of this analysis would not substantively change.

Daily flows from the USGS Gage Station 09085100 (Colorado River Below Glenwood) were obtained and the annual 1E3 and 30E3 low flows were calculated using U.S. Environmental Protection Agency (EPA) DFLOW software. The output from DFLOW provides calculated acute and chronic low flows for each month.

Flow data from October 1, 2004 through September 16, 2014 were available from the gage station. The gage station and time frames were deemed the most accurate and representative of current flows and were therefore used in this analysis.

Based on the low flow analysis described previously, the upstream low flows available to the Rifle WWTF were calculated and are presented in Table A-5.

Table A-5

Low Flows for the Colorado River at the Rifle WWTF

Low Flow (cfs)	*Annual*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*
1E3 Acute	843	846	895	937	1131	2111	1981	1681	1871	1631	1301	1061	843
7E3 Chronic	923	923	967	981	1127	1798	2007	1748	1900	1579	1320	1090	924
30E3 Chronic	923	923	967	986	1182	2152	2007	1748	1900	1640	1320	1090	924

During the months of January, February, June, through August, and October through December, the 7-day average low flow calculated by DFLOW exceeded the chronic low flow. In accordance with Division standard procedures, the acute low flow was thus set equal to the chronic low flow for these months.

The ratio of the low flow of the Colorado River to the Rifle WWTF design flow is 298:1.

Mixing Zones

The amount of the available assimilative capacity (dilution) that may be used by the permittee for the purposes of calculating the WQBELs may be limited in a permitting action based upon a mixing zone analysis or other factor. These other factors that may reduce the amount of assimilative capacity available in a permit are: presence of other dischargers in the vicinity; the presence of a water diversion downstream of the discharge (in the mixing zone); the need to provide a zone of passage for aquatic life; the likelihood of bioaccumulation of toxins in fish or wildlife; habitat considerations such as fish spawning or nursery areas; the presence of threatened and endangered species; potential for human exposure through drinking water or recreation; the possibility that aquatic life will be attracted to the effluent plume; the potential for adverse effects on groundwater; and the toxicity or persistence of the substance discharged.

Unless a facility has performed a mixing zone study during the course of the previous permit, and a decision has been made regarding the amount of the assimilative capacity that can be used by the facility, the Division assumes that the full assimilative capacity can be allocated. Note that the review of mixing study considerations, exemptions and perhaps performing a new mixing study (due to changes in low flow, change in facility design flow, channel geomorphology or other reason) is evaluated in every permit and permit renewal.

If a mixing zone study has been performed and a decision regarding the amount of available assimilative capacity has been made, the Division may calculate the water quality based effluent limitations (WQBELs) based on this available capacity. In addition, the amount of assimilative capacity may be reduced by T&E implications.

The Colorado River is designated as threatened and endangered (T&E) habitat by the U.S. Fish and Wildlife Service. The *Colorado Mixing Zone Implementation Guidance*, dated April 2002, identifies a process in Appendix IV for coordinating with this federal agency on mixing zone implementation. One option available under Appendix IV is having a discharge that requires no mixing zone. Since the discharge is to a T&E stream(s), available asimilative capacity will be zero for aquatic life based standards (Table A-5b).

Table A-5b

Reduced Low Flows for Aquatic Life Based Parameters for the Colorado River at the Rifle WWTF, Based on T&E Classification

Low Flow (cfs)	*Annual*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*
1E3 Acute	0	0	0	0	0	0	0	0	0	0	0	0	0
7E3 Chronic	0	0	0	0	0	0	0	0	0	0	0	0	0
30E3 Chronic	0	0	0	0	0	0	0	0	0	0	0	0	0

Ambient Water Quality

The Division evaluates ambient water quality based on a variety of statistical methods as prescribed in Section 31.8(2)(a)(i) and 31.8(2)(b)(i)(B) of the *Colorado Department of Public Health and Environment Water Quality Control Commission Regulation No. 31*, and as outlined in the Division's Policy for Characterizing Ambient Water Quality for Use in Determining Water Quality Standards Based Effluent Limits (WQP-19). Ambient water quality is evaluated in this WQA analysis for use in determining assimilative capacities and in completing antidegradation reviews for pollutants of concern, where applicable.

To conduct an assessment of the ambient water quality upstream of the Rifle WWTF, data were gathered from USGS Station 09087600 (Colorado River at New Castle) located approximately 10 mile upstream from the facility. Data were available for a period of record from July 2002 through November 2008, however for some parameters, only July 2002 and September 2002 data were available, as noted below under "Number of Samples." Riverwatch Station 550 Rifle Bridge approximately 2 miles upstream was available for a period of record from November 2008 to May 2014. Riverwatch station 551 Rulison approximately 10 miles downstream, was used for hardness data with a period of record November 1995 to May 1998. These data are summarized in **Table A-6.**

Table A-6

Ambient Water Quality for the Colorado River

Parameter	*Number of Samples*	*15th Percentile*	*50th Percentile*	*85th Percentile*	*Mean*	*Max.*	*Chronic Stream Standard*	*Notes*
Temp (°C)	18	2.6	11	17	11	20	NA	
pH (su)	18	8.1	8.3	8.4	8.2	8.5	6.5-9	
E. coli (#/100 ml)	2	15	25	36	20	40	126	1
Nitrate+Nitrite as N (mg/l)	2	0.047	0.16	0.26	0.16	0.31	NA	

NH_3 as N, Tot (mg/l)	2	0	0	0	0	0	TVS	2
As, Dis (µg/l)	36	0	0	0	0	0	340	2
Cd, Dis (µg/l)	41	0	0	0.24	0.11	0.56	0.75	2
Cu, Dis (µg/l)	41	0	0	1.6	0.51	3.3	17	2
Fe, Dis (µg/l)	41	0	18	35	20	63	300	2
Fe, TR (µg/l)	43	96	320	1863	1196	17422	1000	
Pb, Dis (µg/l)	41	0	0	0	0.54	5.4	5.70	2
Mn, Dis (µg/l)	41	0	8.9	18	11	42	50	2
Se, Dis (µg/l)	41	0	0	0	0	0	4.6	2
Zn, Dis (µg/l)	41	0	3.4	9.6	4.5	21	242	2
Hardness as $CaCO_3$ (mg/l)	17	176	228	242	214	250	NA	

Note 1: The calculated mean is the geometric mean. Note that for summarization purposes, the value of one was used where there was no detectable amount because the geometric mean cannot be calculated using a value equal to zero.

Note 2: When sample results were below detection levels, the value of zero was used in accordance with the Division's standard approach for summarization and averaging purposes.

V. Facility Information and Pollutants Evaluated

Facility Information

The Rifle WWTF is located in the NE 1/4, SE 1/4, Section 18, T6S, R93W; 2515 W. Centennial Parkway, Rifle, CO 81650; at 39.525968° latitude North and -107.811937° longitude West in Garfield County. The current design capacity of the facility is 2 MGD (3.1 cfs). Wastewater treatment is accomplished using a mechanical wastewater treatment process. The technical analyses that follow include assessments of the assimilative capacity based on this design capacity.

An assessment of Division records indicate that there are five facilities discharging to the same stream segment or other stream segments immediately upstream or downstream from this facility. Facilities are covered by general permits and have limitations set at the water quality standards. These facilities were not modeled in this WQA as they have a minimal impact on the ambient water quality.

- Cottonwood Springs Mobile Home Park WWTF (COG589110), which discharges to Lower Cactus Valley Ditch, one mile above its confluence with the Colorado River. This facility is located approximately 3.3 miles upstream of the Rifle WWTF. Due to the large amount of dilution of the Colorado River, and the small amount of discharge (0.118 MGD), it is unnecessary to model together with the other dischargers.

- Town of Silt WWTF (COG588046), which discharges to the Colorado River, 7.5 miles upstream of the Rifle WWTF. Due to the large amount of dilution of the Colorado River, and the small amount of discharge (0.75 MGD), it is unnecessary to model together with the other dischargers.

- Talbot Enterprises, Inc. WWTF (COG588061), which discharges to the Colorado River, approximately 15 miles upstream of the Rifle WWTF. Due to the large amount of dilution of the Colorado River, and the small amount of discharge (0.15 MGD), it is unnecessary to model together with the other dischargers.

- Riverbend Subdivision WWTF (COG588006), which discharges to the Colorado River, approximately 15 miles upstream of the Rifle WWTF. Due to the large amount of dilution of the Colorado River, and the small amount of discharge (0.0247 MGD), it is unnecessary to model together with the other dischargers.

- New Castle WWTF (COG588062), which discharges to the Colorado River, approximately 15 miles upstream of the Rifle WWTF. Due to the large amount of dilution of the Colorado River, and the small amount of discharge (0.6 MGD), it is unnecessary to model together with the other dischargers.

There are three additional facilities discharging to the same stream segment or other stream segments approximately 25 miles upstream. The combined design capacity of these three facilities discharging to the Colorado River is 8.54 MGD (13.0 cfs). These facilities were not modeled in this WQA as they have a minimal impact on the ambient water quality, due to the large amount of dilution of the Colorado River, the relatively small amount of discharge and distance involved.

- Glenwood Hot Springs (COG600308) which discharges to the Colorado River, approximately 25 miles upstream of the Rifle WWTF. The current design capacity of the facility is 5.3 MGD (8.2 cfs). This discharge is fed by one natural hot spring (Yampa).
- Iron Mountain Hot Springs (CO0048577) which discharges to the Colorado River, approximately 25 miles upstream of the Rifle WWTF. The current design capacity of the facility is 0.9 MGD (1.4 cfs). This discharge is fed by 1 geothermal well and 2 springs (E. Gamba and Hobo/Iron Mountain).

- The City of Glenwood Springs Regional Wastewater Treatment Facility (WWTF) (CO0048852) which discharges to the Colorado River, approximately 25 miles upstream of the Rifle WWTF. The current design capacity of the facility is 2.34 MGD (3.6 cfs). Wastewater treatment is accomplished using a mechanical wastewater treatment process.

Note that due to the intermittent nature of stormwater discharges, and that these types of discharges do not typically occur at low flow conditions, they are not considered in this WQA.

Pollutants of Concern

Pollutants of concern may be determined by one or more of the following: facility type; effluent characteristics and chemistry; effluent water quality data; receiving water quality; presence of federal effluent limitation guidelines; or other information. Parameters evaluated in this WQA may or may not appear in a permit with limitations or monitoring requirements, subject to other determinations such as a reasonable potential analysis, mixing zone analyses, 303(d) listings, threatened and endangered species listings or other requirement as discussed in a permit rationale.

There are no site-specific in-stream water quality standards for BOD_5 or $CBOD_5$, TSS, percent removal, and oil and grease for this receiving stream. Thus, assimilative capacities were not determined for these parameters. The applicable limitations for these pollutants can be found in Regulation No. 62 and will be applied in the permit for the WWTF.

The following parameters were identified by the Division as pollutants to be evaluated for this facility:

- Total Residual Chlorine
- *E. coli*
- Ammonia
- Temperature
- Metals and Cyanide
- Oil and Grease
- Nonylphenol
- Nutrients
- Salinity

It is the Division's standard procedure to consider metals and cyanide as potential pollutants of concern for all major domestic WWTFs.

According to the *Rationale for Classifications, Standards and Designations of the Lower Colorado,* stream segment COLCLC01 is designated a water supply because The City of Rifle (#123676) and Town of Silt (#123710) withdraw water from the Colorado River for domestic use. However, the nitrate standard is not evaluated as part of this WQA because the withdrawals are upstream of the Rifle WWTF discharge.

During assessment of the facility, nearby facilities, and receiving stream water quality, no additional parameters were identified as pollutants of concern.

VI. Determination of Water Quality Based Effluent Limitations (WQBELs)

Technical Information

Note that the WQBELs developed in the following paragraphs, are calculations of what an effluent limitation may be in a permit. The WQBELs for any given parameter, will be compared to other potential limitations (federal effluent limitations guidelines, state effluent limitations, or other applicable limitation) and typically the more stringent limit is incorporated into a permit. If the WQBEL is the more stringent limitation, incorporation into a permit is dependent upon a reasonable potential analysis.

In-stream background data and low flows evaluated in Sections II and III are used to determine the assimilative capacity of the Colorado River near the Rifle WWTF for pollutants of concern, and to calculate the WQBELs. For all parameters except ammonia, it is the Division's approach to calculate the WQBELs using the lowest of the monthly low flows (referred to as the annual low flow) as determined in the low flow analysis. For ammonia, it is the standard procedure of the

Division to determine monthly WQBELs using the monthly low flows, as the regulations allow the use of seasonal flows.

The Division's standard analysis consists of steady-state, mass-balance calculations for most pollutants and modeling for pollutants such as ammonia. The mass-balance equation is used by the Division to calculate the WQBELs, and accounts for the upstream concentration of a pollutant at the existing quality, critical low flow (minimal dilution), effluent flow and the water quality standard. The mass-balance equation is expressed as:

$$M_2 = \frac{M_3 Q_3 - M_1 Q_1}{Q_2}$$

Where,

Q_1 = Upstream low flow (1E3 or 30E3)
Q_2 = Average daily effluent flow (design capacity)
Q_3 = Downstream flow ($Q_1 + Q_2$)
M_1 = In-stream background pollutant concentrations at the existing quality
M_2 = Calculated WQBEL
M_3 = Water Quality Standard, or other maximum allowable pollutant concentration

When Q1 equals zero, Q2 equals Q3, and the following results:

$$M_2 = M_3$$

For aquatic life parameters, the low flow (Q1) for the Colorado River is considered to be zero. The WQBELs for the Colorado River for the pollutants of concern are equal to the in-stream water quality standards.

A more detailed discussion of the technical analysis is provided in the pages that follow.

The upstream background pollutant concentrations used in the mass-balance equation will vary based on the regulatory definition of existing ambient water quality. For most pollutants, existing quality is determined to be the 85th percentile. For metals in the total or total recoverable form, existing quality is determined to be the 50th percentile. For pathogens such as fecal coliform and *E. coli*, existing quality is determined to be the geometric mean.

For temperature, the highest 7-day mean (for the chronic standard) of daily average stream temperature, over a seven consecutive day period will be used in calculations of the chronic temperature assimilative capacity, where the daily average temperature should be calculated from a minimum of three measurements spaced equally through the day. The highest 2-hour mean (for the acute standard) of stream temperature will be used in calculations of the acute temperature assimilative capacity. The highest 2-hour mean should be calculated from a minimum of 12 measurements spaced equally through the day.

Calculation of WQBELs

Using the mass-balance equation provided in the beginning of Section VI, the acute and chronic low flows set out in Section IV, ambient water quality as discussed in Section IV, and the in-stream standards shown in Section III, the WQBELs for were calculated. The data used and the resulting WQBELs, M_2, are set forth in Table A-7a for the chronic WQBELs and A-7b for the acute WQBELs.

When the ambient water quality exceeds the in-stream standard, the Division standard procedure is to allocate the water quality standard to prevent further degradation of the receiving waters.

Chlorine: There are no point sources discharging total residual chlorine within one mile of the Rifle WWTF. Because chlorine is rapidly oxidized, in-stream levels of residual chlorine are detected only for a short distance below a source. Ambient chlorine was therefore assumed to be zero.

***E. coli*:** There are no point sources discharging *E. coli* within one mile of the Rifle WWTF. Thus, WQBELs were evaluated separately. For *E. coli*, the Division establishes the 7-day geometric mean limit as two times the 30-day geometric mean WQBEL and also includes maximum limits of 2,000 colonies per 100 ml (30-day geometric mean) and 4,000 colonies per 100 ml (7-day geometric mean). This 2000 colony limitation also applies to discharges to ditches.

Temperature:
The 7E3 low flow is 923 cfs, resulting in a dilution ratio (7E3 low flow to effluent) of 298:1. As the discharge is from a Domestic WWTF where the available dilution ratio is > 10:1. Typically, in accordance with the Division's Temperature Policy, no temperature limitations would be required. However, the facility is discharging to a T&E listed segment and therefore limitations for most parameters are based on a zero low flow condition and temperature limitations will apply.

Table A-7a

Chronic WQBELs

Parameter	Q_1 *(cfs)*	Q_2 *(cfs)*	Q_3 *(cfs)*	M_1	M_3	M_2
Temp MWAT (°C) April-Oct	0	3.1	3.1	NA	18	***18.3***
Temp MWAT (°C) Nov-March	0	3.1	3.1	NA	9	***9***
pH (su)					6.5-9	***6.5-9***
E. coli (#/100 ml)	923	3.1	926.1	20	126	***31687***
TRC (mg/l)	0	3.1	3.1	0	0.011	***0.011***
As, TR (µg/l)	923	3.1	926.1	0	0.02	***6***
Cd, Dis (µg/l)	0	3.1	3.1	0.24	0.75	***0.75***
Cr+3, Dis (µg/l)	0	3.1	3.1	0	138	***138***
Cr+6, Dis (µg/l)	0	3.1	3.1	0	11	***11***
Cu, Dis (µg/l)	0	3.1	3.1	1.6	17	***17***
Fe, TR (µg/l)	0	3.1	3.1	320	1000	***1000***
Pb, Dis (µg/l)	0	3.1	3.1	0	5.7	***5.7***
Mn, Dis (µg/l)	0	3.1	3.1	18	2125	***2125***
Mo, TR (µg/l)	923	3.1	926.1	0	160	***47799***
Hg, Tot (µg/l)	923	3.1	926.1	0	0.01	***3***
Ni, Dis (µg/l)	0	3.1	3.1	0	99	***99***
Se, Dis (µg/l)	0	3.1	3.1	0	4.6	***4.6***
Ag, Dis (µg/l)	0	3.1	3.1	0	0.28	***0.28***
Zn, Dis (µg/l)	0	3.1	3.1	9.6	242	***242***
Nonylphenol (µg/l)	0	3.1	3.1	0	6.6	***6.6***

Table A-7b

Acute WQBELs

Parameter	Q_1 *(cfs)*	Q_2 *(cfs)*	Q_3 *(cfs)*	M_1	M_3	M_2
Temp Daily Max (°C) April-Oct	0	3.1	3.1	NA	23.9	***23.9***
Temp Daily Max (°C) Nov-March	0	3.1	3.1	NA	13.0	***13***
E. coli (#/100 ml)	for E Coli calculations: chronic X 2 = acute					***63374***
TRC (mg/l)	0	3.1	3.1	0	0.019	***0.019***
As, Dis (µg/l)	0	3.1	3.1	0	340	***340***
Cd, Dis (µg/l)	0	3.1	3.1	0.24	3.3	***3.3***
Cr+3, Dis (µg/l)	0	3.1	3.1	0	1062	***1062***
Cr+6, Dis (µg/l)	0	3.1	3.1	0	16	***16***
Cu, Dis (µg/l)	0	3.1	3.1	1.6	28	***28***
CN, Free (µg/l)	0	3.1	3.1	0	5	***5***
Pb, Dis (µg/l)	0	3.1	3.1	0	146	***146***
Mn, Dis (µg/l)	0	3.1	3.1	18	3847	***3847***
Ni, Dis (µg/l)	0	3.1	3.1	0	891	***891***
Se, Dis (µg/l)	0	3.1	3.1	0	18.4	***18***
Ag, Dis (µg/l)	0	3.1	3.1	0	7.5	***7.5***
Zn, Dis (µg/l)	0	3.1	3.1	9.6	320	***320***
Nonylphenol (µg/l)	0	3.1	3.1	0	28	***28***

Ammonia: The Ammonia Toxicity Model (AMMTOX) is a software program designed to project the downstream effects of ammonia and the ammonia assimilative capacities available to each discharger based on upstream water quality and effluent discharges. To develop data for the AMMTOX model, an in-stream water quality study should be conducted of the upstream receiving water conditions, particularly the pH and corresponding temperature, over a period of at least one year.

Temperature and corresponding pH data sets reflecting upstream ambient receiving water conditions were available for the Colorado River based from USGS Station 09087600 (Colorado River at New Castle) located approximately 10 mile upstream from the facility. Since the receiving stream segment is designated as threatened and endangered (T&E) habitat by the U.S. Fish and Wildlife Service, the available asimilative capacity will be zero for ammonia. However, paired temperature and pH data from USGS Station 09087600 from July 2002 through November 2008 were used to establish a setpoint. Effluent pH and temperature data were also available from the Rifle WWTF and were used to establish the average facility contributions in the AMMTOX model.

The AMMTOX may be calibrated for a number of variables in addition to the data discussed above. The values used for the other variables in the model are listed below:

- Stream velocity = $0.3Q^{0.4d}$
- Default ammonia loss rate = 6/day
- pH amplitude was assumed to be medium
- Default times for pH maximum, temperature maximum, and time of day of occurrence
- pH rebound was set at the default value of 0.2 su per mile
- Temperature rebound was set at the default value of 0.7 degrees C per mile.

The results of the ammonia analyses for the Rifle WWTF are presented in **Table A-8.**

Table A-8

AMMTOX Results for the Colorado River at the Rifle WWTF

Month	*Total Ammonia Chronic (mg/l)*	*Total Ammonia Acute (mg/l)*
January	3.5	5.3
February	3.2	4.9
March	3.6	5.5
April	3.1	4.7
May	3.1	4.3
June	3.2	4.3
July	3.2	4.1
August	3.1	4.1
September	3.0	4.0
October	3.0	4.0
November	3.1	4.2
December	3.4	4.9

Whole Effluent Toxicity (WET) Testing:

The Water Quality Control Division has established the use of WET testing as a method for identifying and controlling toxic discharges from wastewater treatment facilities. WET testing is being utilized as a means to ensure that there are no discharges of pollutants "in amounts, concentrations or combinations which are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life" as required by Section 31.11 (1) of the Basic Standards and Methodologies for Surface Waters. The requirements for WET testing are being implemented in accordance with Division policy, Implementation of the Narrative Standard for Toxicity in Discharge Permits Using Whole Effluent Toxicity (Sept 30, 2010). Note that this policy has recently been updated and the permittee should refer to this document for additional information regarding WET.

In-Stream Waste Concentration (IWC) – Where monitoring or limitations for WET are deemed appropriate by the Division, the chronic in-stream dilution is critical in determining whether acute or chronic conditions shall apply. In accordance with Division policy, for those discharges where the chronic IWC is greater than 9.1% and the receiving stream has a Class 1 Aquatic Life use or Class 2 Aquatic Life use with all of the appropriate aquatic life numeric standards, chronic conditions will

normally apply. Where the chronic IWC is less than or equal to 9.1, or the stream is not classified as described above, acute conditions will normally apply. The chronic IWC is determined using the following equation:

IWC = [Facility Flow (FF)/(Stream Chronic Low Flow (annual) + FF)] X 100%

The flows and corresponding IWC for the appropriate discharge point are:

Permitted Feature	Chronic Low Flow, 30E3 (cfs)	Facility Design Flow (cfs)	IWC, (%)
001A	0	3.1	100

The IWC for this permit is 100%, which represents a wastewater concentration of 100 % effluent to 0 % receiving stream because the discharge is to a T&E stream(s), and available asimilative capacity will be zero. This IWC correlates to chronic WET testing. The fact sheet and the permit will contain additional information regarding the type of WET testing applicable to this facility.

VII. Antidegradation Evaluation

As set out in *The Basic Standards and Methodologies for Surface Water*, Section 31.8(2)(b), an antidegradation analysis is required except in cases where the receiving water is designated as "Use Protected." Note that "Use Protected" waters are waters "that the Commission has determined do not warrant the special protection provided by the outstanding waters designation or the antidegradation review process" as set out in Section 31.8(2)(b). The antidegradation section of the regulation became effective in December 2000, and therefore antidegradation considerations are applicable to this WQA analysis.

According to the *Classifications and Numeric Standards for Lower Colorado River Basin*, stream segment COLCLC01 is Undesignated. Thus, an antidegradation review may be conducted for this segment if new or increased impacts are found to occur. However, the ratio of the flow of the Colorado River to the City of Rifle WWTF design flow is 298:1 at low flows. Section 31.8 (3)(c) specifies that the discharge of pollutants should not be considered to result in significant degradation of the reviewable waters if the flow rate is greater than 100:1 dilution at low flow. Thus, Section 31.8(3)(c) of the regulations is met and no further antidegradation evaluation is necessary.

VIII. Technology Based and Control Based Limitations

Federal Effluent Limitation Guidelines

The Federal Effluent Limitation Guidelines for domestic wastewater treatment facilities are the secondary treatment standards. These standards have been adopted into, and are applied out of, Regulation 62, the Regulations for Effluent Limitations.

Regulations for Effluent Limitations

Regulation No. 62, the Regulations for Effluent Limitations, includes effluent limitations that apply to all discharges of wastewater to State waters, with the exception of storm water and agricultural return flows. These regulations are applicable to the discharge from the proposed discharge.

Table A-9 contains a summary of the applicable limitations for pollutants of concern at this facility.

Table A-9

Regulation 62 Based Limitations

Parameter	*30-Day Average*	*7-Day Average*	*Instantaneous Maximum*
BOD_5	30 mg/l	45 mg/l	NA
BOD_5 Percent Removal	85%	NA	NA
TSS, mechanical plant	30 mg/l	45 mg/l	NA
TSS Percent Removal	85%	NA	NA
Total Residual Chlorine	NA	NA	0.5 mg/l
pH	NA	NA	6.0-9.0 s.u.
Oil and Grease	NA	NA	10 mg/l

Nutrient Effluent Limitation Considerations

WQCC Regulation No. 85, the new *Nutrients Management Control Regulation*, includes technology based effluent limitations for total inorganic nitrogen and total phosphorus that currently, or will in the future, apply to many domestic wastewater discharges to State surface waters. These effluent limits for dischargers are to start being implemented in permitting actions as of July 1, 2013, and are shown in the two tables below:

Effluent Limitations Table at 85.5(1)(a)(iii)

For all Domestic Wastewater Treatment Works not identified in subsections (a)(i) or (ii) above(in Reg. 85) *and discharging prior to May 31, 2012 or for which a complete request for preliminary effluent limits has been submitted to the Division prior to May 31, 2012, the following numeric limits shall apply:*

Parameter	*Parameter Limitations*	
	Annual Median [1]	*95th Percentile [2]*
Total Phosphorus	*1.0 mg/l*	*2.5 mg/l*
Total Inorganic Nitrogen[3]	*15 mg/l*	*20 mg/l*

1 Running Annual Median: The median of all samples taken in the most recent 12 calendar months.
2 The 95th percentile of all samples taken in the most recent 12 calendar months.
3 Determined as the sum of nitrate as N, nitrite as N, and ammonia as N.

Effluent Limitations Table at 85.5(1)(b)

For New Domestic Wastewater Treatment Works which submit a complete request for preliminary effluent limits to the Division on or after May 31, 2012, the following numeric limits shall apply:

Parameter	*Parameter Limitations*	
	Annual Median [1]	*95th Percentile [2]*
Total Phosphorus	*0.7 mg/l*	*1.75 mg/l*
Total Inorganic Nitrogen[3]	*7 mg/l*	*14 mg/l*

1 Running Annual Median: The median of all samples taken in the most recent 12 calendar months.

2 The 95th percentile of all samples taken in the most recent 12 calendar months.
3 Determined as the sum of nitrate as N, nitrite as N, and ammonia as N.

Requirements in Reg. 85 also apply to non-domestic wastewater for industries in the Standard Industrial Class 'Major Group 20,' and any other non-domestic wastewater where the facility is expected, without treatment, to discharge total inorganic nitrogen or total phosphorus concentrations in excess of the numeric limits listed in 85.5 (1)(a)(iii). The facility must investigate, with the Division's approval, whether different considerations should apply.

All permit actions based on this WQA will occur after the July 1, 2013 permit implementation date of Reg. 85. Therefore, total inorganic nitrogen and total phosphorus effluent limitations potentially imposed because of Reg. 85 must be considered. However, also based on Reg. 85, there are direct exemptions from these limitations for smaller domestic facilities that discharge less than 1 million gallons per day (MGD), or are a domestic facility owned by a disadvantaged community.

Delayed implementation (until 5/31/2022) is also specified in Reg. 85 to occur for domestic WWTFs that discharge 1 MGD or more, and less than or equal to 2.0 MGD, or have an existing watershed control regulations (such as WQCC Reg.'s 71-74), or where the discharge is to waters in a low-priority 8-digit HUC. **Since the design capacity of the Rifle WWTF is 2.0 MGD, the facility is eligible for delayed implementation in accordance with Regulation 85.**

For all other larger domestic WWTFs, the nutrient effluent limitations from the two tables above will apply, unless other considerations allowed by Reg. 85 at 85.5(3) are utilized to show compliance with exceptions or variances to these limitations.

However, the Division does not intend these results to discourage this WWTF from working on nutrient control with the other dischargers within the Colorado River watershed. These dischargers upstream and downstream of the Rifle WWTF have the potential to create future nutrient issues in the Colorado River. The Division encourages these entities to all work together to create the most efficient and cost effective solutions for nutrient control in the Colorado River watershed.

Supplemental Reg. 85 Nutrient Monitoring

Reg. 85 also requires that some monitoring for nutrients in wastewater effluent and streams take place, independent of what nutrient effluent limits or monitoring requirements may be established in a discharge permit. The requirements for the type and frequency of this monitoring are set forth in Reg. 85 at 85.6. This nutrient monitoring is not currently required by a permitting action, but is still required to be done by the Reg. 85 nutrient control regulation. Nutrient monitoring for the Reg. 85 control regulation is currently required to be reported to the WQCD Environmental Data Unit.

IX. References

Regulations:

The Basic Standards and Methodologies for Surface Water, Regulation 31, Colorado Department Public Health and Environment, Water Quality Control Commission, effective January 31, 2013.

Classifications and Numeric Standards for Lower Colorado River Basin, Regulation No. 37, Colorado Department Public Health and Environment, Water Quality Control Commission, effective 6/30/2014.

Colorado River Salinity Standards, Regulation 39, CDPHE, WQCC (last update effective 8/30/97)

Regulations for Effluent Limitations, Regulation 62, CDPHE, WQCC, July 30, 2012.

Nutrients Management Control Regulation, Regulation 85, Colorado Department Public Health and Environment, Water Quality Control Commission, effective September 30, 2012.

Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List, Regulation 93, Colorado Department Public Health and Environment, Water Quality Control Commission, effective March 30, 2012.

Policy and Guidance Documents:

Antidegradation Significance Determination for New or Increased Water Quality Impacts, Procedural Guidance, Colorado Department Public Health and Environment, Water Quality Control Division, December 2001.

Memorandum Re: First Update to (Antidegradation) Guidance Version 1.0, Colorado Department Public Health and Environment, Water Quality Control Division, April 23, 2002.

Post Hearing Rationale for Classifications, Standards and Designations of Segments of the Lower Colorado, Colorado Department Public Health and Environment, Water Quality Control Division, effective May, 2014.

Policy Concerning Escherichia coli versus Fecal Coliform, CDPHE, WQCD, July 20, 2005.

Colorado Mixing Zone Implementation Guidance, Colorado Department Public Health and Environment, Water Quality Control Division, effective April 2002.

Policy for Conducting Assessments for Implementation of Temperature Standards in Discharge Permits, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-23, effective July 3, 2008.

Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-24, effective March 10, 2008.

Policy for Characterizing Ambient Water Quality for Use in Determining Water Quality Standards Based Effluent Limits, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-19, effective May 2002.